

CLAIMS

1. A thrust reverser comprising:
 - a fan nacelle having radially outer and inner skins extending axially from a leading edge defining an inlet to a trailing edge defining an outlet;
 - an outer door pivotally mounted to said nacelle in said outer skin;
 - an inner door pivotally mounted to said nacelle in said inner skin in opposition with said outer door;
 - a drive link pivotally joining together said outer and inner doors; and
 - an actuator joined to said doors for rotation thereof between a stowed position at which said doors are pivoted closed substantially flush in said inner and outer skins, and a deployed position at which said outer door is pivoted open and extends radially outwardly from said outer skin, and said inner door is pivoted open and extends radially inwardly from said inner skin.
2. A reverser according to claim 1 wherein:
 - said outer and inner skins are spaced radially apart to define a compartment spaced forwardly of said nacelle trailing edge; and
 - said doors, link, and actuator are contained within said compartment in said stowed position without obstruction inside said inner skin.
3. A reverser according to claim 2 wherein:
 - said outer door includes forward and aft ends, and is pivotally joined to said nacelle axially therebetween for deploying said forward end radially outwardly from said outer skin, and said aft end radially inwardly from said outer skin; and
 - said inner door includes forward and aft ends, and is pivotally joined to said nacelle adjacent said aft end of said inner door for deploying radially inwardly said inner door in unfolding opposition to said outer door.
4. A reverser according to claim 3 wherein said aft end of said outer door is axially

arcuate and adjoins said inner door in said deployed position for reverse turning airflow from said inner door to said outer door.

5. A reverser according to claim 3 further comprising:
 - a gang of said outer doors pivotally joined to said nacelle in said compartment in axial alignment atop said inner door;
 - a unison link pivotally joining together said gang of said outer doors; and
 - said drive link pivotally joins together said outer door gang and said inner door for deploying outwardly in unison said outer doors as said inner door is deployed inwardly.
6. A reverser according to claim 5 wherein said gang of outer doors are pivotally joined to said nacelle axially between said forward and aft ends of said outer doors for deploying outwardly in unison said forward ends thereof, and deploying inwardly in unison said aft ends thereof.
7. A reverser according to claim 6 wherein said unison link is pivotally joined to said outer doors aft of said pivotal joining of said outer doors with said nacelle.
8. A reverser according to claim 7 further comprising a pair of circumferentially spaced apart cantilevers having proximal ends fixedly mounted to said nacelle in said compartment, with an aft outer door being pivotally joined to distal ends thereof, and a forward outer door being pivotally joined to an intermediate portion thereof.
9. A reverser according to claim 8 wherein said cantilevers are thin circumferentially and thick radially, and said forward outer door includes complementary axial slots extending in said aft end thereof for passing said cantilevers to said aft outer door.
10. A reverser according to claim 8 wherein said drive link is pivotally joined between an aft end of said unison link and said forward end of said inner door.

11. A reverser according to claim 8 wherein said drive link is pivotally joined between said aft end of said forward outer door and said forward end of said inner door.
12. A reverser according to claim 8 further comprising a single unison link mounted to said outer doors centrally between said cantilevers.
13. A reverser according to claim 8 further comprising a pair of said unison links mounted to said outer doors along respective ones of said cantilevers.
14. A reverser according to claim 8 wherein said actuator is fixedly joined to said nacelle inside said compartment, and is pivotally joined to a forward end of said unison link by an idler link therebetween.
15. A reverser according to claim 8 wherein said actuator is pivotally joined to said nacelle inside said compartment, and is pivotally joined to said forward outer door.
16. A reverser according to claim 8 wherein said forward and aft outer doors have axially arcuate aft ends, and are axially nested coextensive with said outer skin when stowed.
17. A reverser according to claim 16 wherein said aft end of said forward outer door has axially longer curvature than said aft end of said aft outer door.
18. A reverser according to claim 8 wherein:
said nacelle compartment includes a flow tunnel extending radially between said inner and outer skins and is closed by said outer and inner doors when stowed; and
said tunnel has a radially arcuate forward wall being substantially concentric with axially arcuate aft ends of said forward and aft outer doors when deployed.
19. A reverser according to claim 18 wherein said forward wall of said tunnel is inclined axially forward at said nacelle outer skin, and said forward ends of said forward and aft outer

doors are disposed substantially parallel thereto when deployed.

20. A reverser according to claim 18 wherein said tunnel includes a perimeter seal adjacent said inner skin against which said inner door compresses when stowed.

21. A reverser according to claim 18 wherein said forward and aft outer doors include side fairings along opposite circumferential sides of said forward ends thereof corresponding with sidewalls of said tunnel.

22. A reverser according to claim 18 wherein said forward outer door includes a sharp edge at said aft end thereof for reducing flow stagnation when deployed.

23. A reverser according to claim 18 wherein said forward outer door has a larger area aft end than said forward end thereof aft of said pivotal joining with said cantilevers.

24. A reverser according to claim 18 wherein said forward outer door includes axial slots in said aft end for receiving said cantilevers and permitting airflow therethrough when deployed.

25. A reverser according to claim 18 wherein said aft outer door is mounted to said cantilevers to pivot less than said forward outer door when deployed.

26. A reverser according to claim 18 wherein said aft outer door has a larger area aft end than said forward end thereof aft of said pivotal joining with said cantilevers.

27. A reverser according to claim 18 wherein said inner door includes an arcuate louver fairing in said aft end thereof for adjoining said arcuate aft end of said aft outer door when deployed.

28. A reverser according to claim 27 wherein said inner door further includes side fences

along opposite circumferential sides of said aft end thereof.

29. A reverser according to claim 18 further comprising:
groups of said inner door and outer doors gangs spaced circumferentially apart around said nacelle; and
said inner doors have trapezoidal configurations for circumferential adjoining each other inside said inner skin when deployed.
30. A reverser according to claim 8 further comprising means for selectively locking closed said outer and inner doors.
31. A reverser according to claim 30 wherein said locking means comprise:
a tab fixedly mounted to one of said doors; and
a locking actuator fixedly mounted to said nacelle, and having an extendable rod aligned with said tab for engaging an aperture therein to lock said doors when stowed.
32. A reverser according to claim 31 wherein said locking means further comprise a spring-loaded retainer mounted to said nacelle adjacent said locking actuator for retaining retracted said rod of said locking actuator when said doors are deployed open.
33. A reverser according to claim 32 wherein:
said locking tab is fixedly mounted to said forward end of said inner door; and
said locking actuator and retainer are mounted to said nacelle adjacent said inner skin.
34. A reverser according to claim 32 wherein:
said locking tab is fixedly mounted to said forward end of said forward outer door; and
said locking actuator and retainer are mounted to said nacelle adjacent said outer skin.
35. A reverser according to claim 8 further comprising:
a core engine having an external core cowl mounted inside said nacelle to define an

annular bypass duct therebetween terminating in a fan nozzle at said nacelle trailing edge; and
said inner door is sized to reach said core cowl when deployed, and block flow discharge through said fan nozzle for reversing thrust along said deployed outer door.

36. A fan thrust reverser comprising:

a fan nacelle having outer and inner skins extending between leading and trailing edges, and an annular compartment between said skins having a flow tunnel extending radially therebetween;

a gang of outer louver doors pivotally joined to said nacelle in said compartment to close said tunnel along said outer skin;

an inner blocker door pivotally joined to said nacelle in said compartment in opposition with said louver doors to close said tunnel along said inner skin;

a unison link pivotally joining together said louver doors;

a drive link pivotally joining together said louver doors with said blocker door;

an actuator joined to said louver doors for simultaneously rotating said louver doors from a stowed position closing said tunnel at said outer skin to a deployed position inclined outwardly from said outer skin to open said tunnel; and

said drive link being configured for correspondingly pivoting said blocker door between a stowed position thereof closing said tunnel to a deployed position thereof opening said tunnel.

37. A reverser according to claim 36 wherein said louver doors include forward and aft ends, and are pivotally mounted to said nacelle axially between said ends for deploying said forward ends thereof radially outwardly from said outer skin, and said aft ends thereof radially inwardly from said inner skin.

38. A reverser according to claim 37 wherein said louver doors have axially arcuate aft ends, and are axially nested coextensive with said outer skin when stowed.

39. A reverser according to claim 38 wherein said blocker door includes an aft end

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pivotally mounted to said nacelle for deploying a forward end thereof radially inwardly in opposite inclination with said louver doors.

40. A reverser according to claim 39 further comprising means for selectively locking closed said louver and blocker door when stowed.